

A NEW SEA ANEMONE FROM SOUTH AFRICA
(ANTHOZOA, PTYCHODACTIARIA)

By

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&

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(With 11 figures and 2 tables)

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ABSTRACT

Preactis millardae gen. et sp. nov., found typically off the Atlantic coast of the Cape Peninsula, is described with details of its distribution and behaviour. The species has taxonomic characters that compare with those of *Dactylanthus antarcticus* Carlgren, 1911, and place it in the order Ptychodactiaria, but it also possesses characters that necessitate a redefinition of that order and the creation of a new family, the Preactiidae, to accommodate it. Some additional data are also given on *D. antarcticus*.

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INTRODUCTION

This paper describes a South African sea anemone that is a most interesting addition to a rare and relatively little-known group, the Ptychodactiaria. Until now the Ptychodactiaria have included one species recorded from the Antarctic and one from the Arctic (Carlgren 1949). The description of this new species is introduced with a summary of what is known about its occurrence and biology, together with available photographic records. It is hoped that this will stimulate further discoveries.

Apart from three finds of specimens washed up on beaches, SCUBA divers have discovered the new anemone attached to rocks at depths of 10–20 m. It has been found at Oudekraal off the Atlantic coast of the Cape Peninsula, which would seem to represent a typical habitat (Velimirov *et al.* 1977), and at Roman Rock in False Bay. Stranded specimens have been found at Maclear's Beach (near Cape Point) and near Hermanus. This is undoubtedly a cold-water species that occurs in the Benguela Current (see Day 1970; Brown & Jarman 1978; Andrews & Hutchings 1980; Field *et al.* 1980). Its origin and precise distribution, however, remain unknown. It is worth noting that specimens so far discovered all seem to have been of adult size, and that small anemones or juveniles, which might be expected to occur in a representative cross-section of the population, have not yet been found. Of seven preserved individuals all except the smallest one bear gonads, but nothing is yet known about the life history or about possible modes of dispersal.

OCCURRENCE AND GENERAL OBSERVATIONS

During the period 1972–82 several specimens were collected and information about their distribution and general biology is drawn up here in chronological order. Localities indicated on the map (Fig. 1) are sites corresponding to five sets of records.

ROMAN ROCK, FALSE BAY

Two specimens at about 10 m on red gorgonians were collected by SCUBA diving and brought by R. J. Griffiths to J. H. Day, 3 December 1972. Preserved specimens now mislaid (CP 809, Zoology Department, University of Cape Town), but identifiable from Day's notes and two photographs taken by him: 'Basal disc poorly developed, not attached. Animal mobile, progresses by means of hollow finger-like appendages on column wall. Oral disc smooth no tentacles visible—maybe a few small tentacles inside mouth—requires dissection. Thin translucent body wall—white, column appendages white with yellow-brown tips. Brown radiating lines on basal and oral discs which appear to mark insertion of mesenteries. 2 siphonoglyphs only.'

One of the photographs is shown in Figure 2A.

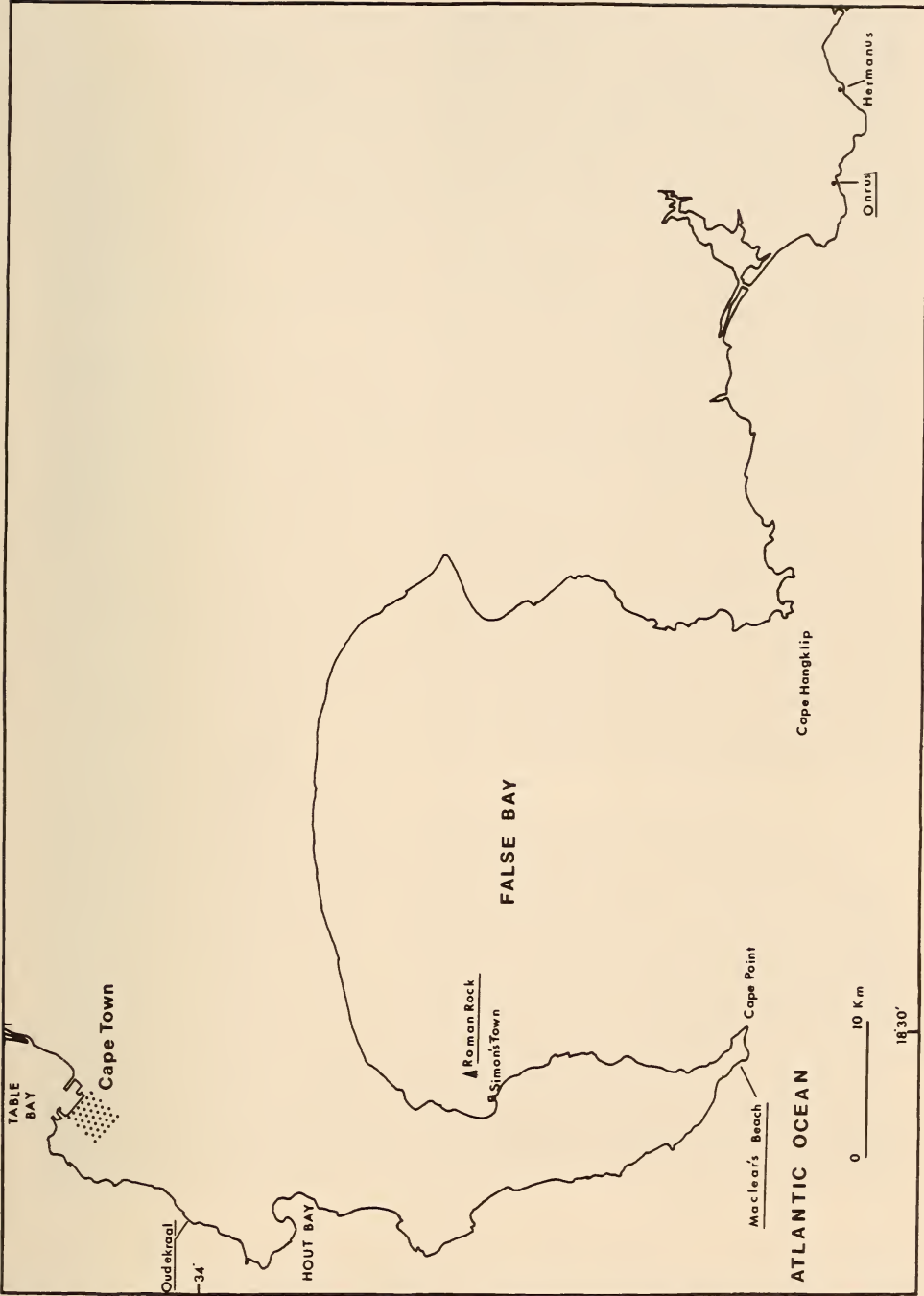


Fig. 1. Map showing collection sites of specimens referred to in the text: Roman Rock, Onrus, Oudekraal and Maclear's Beach are underlined.

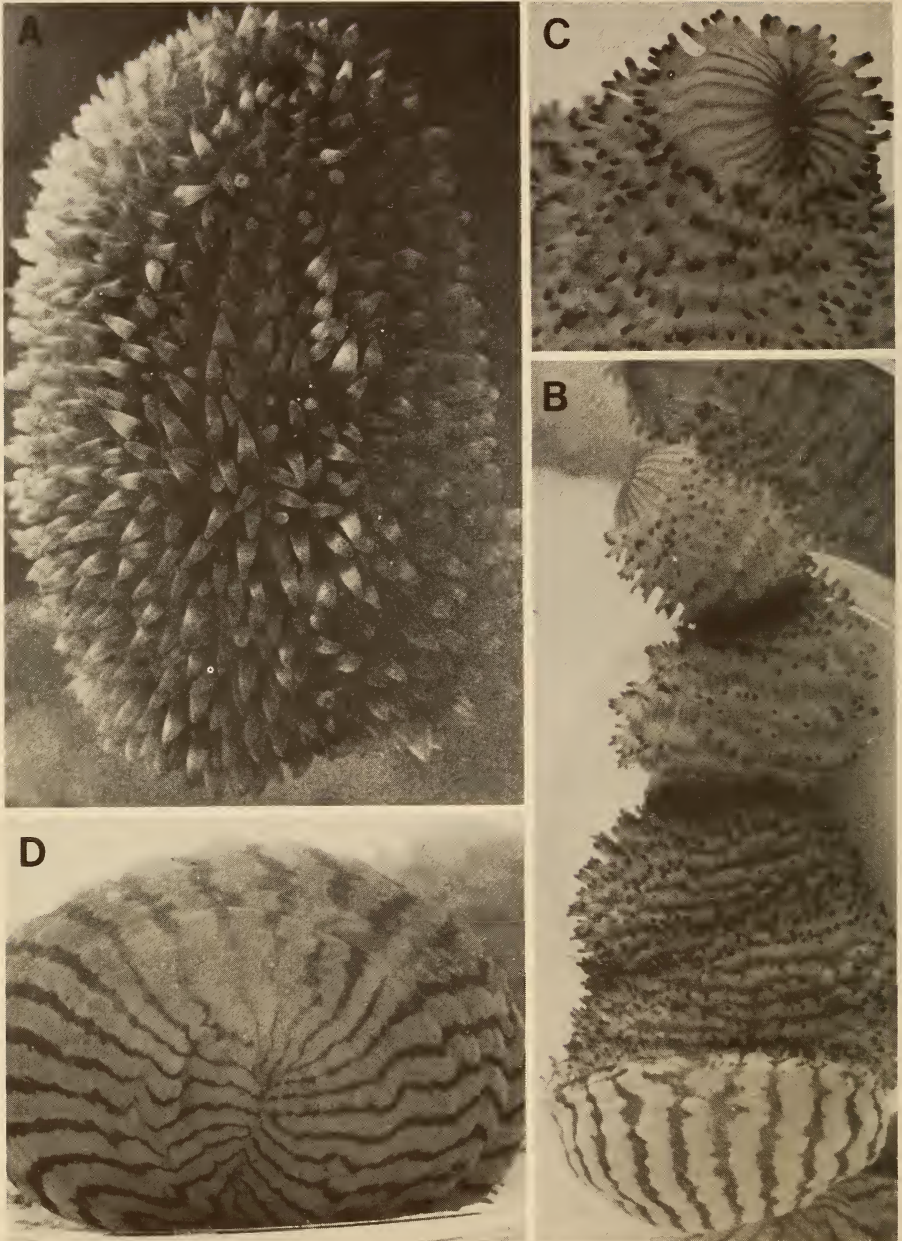


Fig. 2. A. Specimen from Roman Rock, False Bay (CP 809, photo J. H. Day). Note mesentery insertions. Approx. $\times 1$. B-D. Specimen from beach at Onrus (SAM-H1677, photos S. X. Kannemeyer). B. Note peristaltic waves (moving from the base) and vesicles in transverse rows. Approx. $\times 1$. C. Oral disc, $\times 2$. D. Pedal disc, $\times 1.5$.

ONRUS, NEAR HERMANUS

One specimen found loose in a rock pool, collected by M. R. Polchet and brought to N. A. H. Millard at the South African Museum, 4 February 1973. This anemone was observed and preserved by Millard (SAM-H1677), and photographed by S. X. Kannemeyer of the South African Museum. The photographs suggest that the column was up to 13 cm long, the basal disc about 5 cm and the oral disc 1.7 cm in diameter. General coloration orangey-pink: the tips of the vesicles covering the column darker in tone, the column pale. Mouth and oral disc, also the pedal disc, white with twenty-four radial red stripes. The vesicles appeared to be in transverse rows but tentacles were not evident. Millard also noted that the animal made no attempt to attach to the dish by means of the base or vesicles, and performed 'peristaltic' contractions of the whole column. Peristaltic waves moved distally from the base.

The photographs are shown in Figure 2B-D.

Millard's further comments: 'It was probably brought into this coast by currents or wind' (7 May 1973); and 'I have shown the slide to various people and am told that this creature has been seen before several times' (11 April 1975).

OUDEKRAAL, CAPE PENINSULA

A cold-water habitat at about 10-12 °C, very exposed conditions with fast current, depth 10-15 m. About six specimens seen while SCUBA diving by C. L. Griffiths and the two largest were collected on 7 October 1976. All appeared to be 'attached' to a vertical granite rock by the pedal disc: they were vertical in position and 'closed up'. Griffiths observed some variation in size, from perhaps 5 cm upwards, although he thought that apparently smaller specimens might simply have been more contracted. There was some variation in colour between individuals, but the two collected looked almost identical. The habitat is characterized by *Allopora*, gorgonians (*Eunicella*), solitary corals, golf-ball sponges (*Haliclona*) and *Gorgonocephalus*, as described by Velimirov *et al.* (1977).

The two specimens collected (SAM-H2822 and BMNH 1983.4.27.1) were observed and photographed in the Zoology Department, University of Cape Town, by Griffiths and by Robson, who preserved them after making the following notes.

In one specimen the column was at least 20 cm long, the pedal disc 7-9 cm and the oral disc 2 cm in diameter. Vesicles covering the column pinkish mauve with orange tips. Twenty-four radial stripes marking the insertion of mesenteries dark red on the oral disc, orange on the pedal disc. On the column, brownish lines correspond to mesenteries. Background colour pale orange. On the column, vesicles are of all sizes and seem to lack regular alignment. There are two siphonoglyphs, and bilateral symmetry of the pedal disc is also evident.

In the laboratory detached specimens readily change shape. Their mobility of profile gives the impression that behaviour in natural conditions may be fairly

adaptable. Relatively little, however, was discerned as the specimens observed were subjected to bright light and to higher temperatures than usual. This anemone exhibits no specialized rapid contractions. Peristaltic waves were seen to travel quite fast, in this case from the oral disc to the base. The circular muscle of vesicles as well as of the column may be involved. The specimen in Figure 3A reacted to a mechanical stimulus with two or three peristaltic waves after which the column shortened to about 10 cm. When the column was contracted the pedal disc usually became inflated and very thin but it showed no tendency to adhere. The other specimen collected by Griffiths, however, soon afterwards attached itself quite firmly by the base to the bottom of a deep plastic bowl, assuming the shape of a truncated cone. In both specimens the vesicles throughout seemed non-adhesive and they did not move individually unless touched. In general their changes in length or tone were associated with those of other muscles (e.g., as noted, peristalsis of the column) and local responses of their circular and longitudinal muscles were not very evident. In the Oudekraal habitat some ability to reattach to rocks if swept off by the current may be expected, but laboratory observations provided few clues about this.

Griffiths noted in a letter: 'Incidentally, the anemone is quite common—I have mentioned it to several divers and they all know about it' (2 May 1980).

Photographs by Griffiths of one of the specimens are shown in Figure 3A–D. The photograph for Figure 4A was taken by Robson.

MACLEAR'S BEACH, CAPE POINT NATURE RESERVE

Four small specimens found stranded by S. X. Kannemeyer on 4 August 1980 are now in the South African Museum (SAM–H3030). Preserved in alcohol, three of these specimens measure 3, 4 and 5 cm in length respectively.

One stranded specimen found in a tide pool by T. M. Gosliner on 27 November 1981. He noted 'very bright orange coloration'.

Cnidae from SAM–H3030 are shown in Figure 4B.

ATLANTIC COAST OF THE CAPE PENINSULA

Observed by T. M. Gosliner to occur commonly at 10–20 m, e.g. at Hottentot's Huisie, near Oudekraal, during his research dives in the early months of 1981 and 1982.

Gosliner took underwater photographs, and collected and preserved several specimens (including CASIBP 034038 at the California Academy of Sciences, San Francisco, examined by D. F. Dunn). His observations and comments are quoted verbatim from letters:

'We have been finding them commonly (about 5–6 individuals observed during an hour dive). . . . Therefore I suspect that the populations are larger. Generally specimens are loosely attached to the hydrocoral *Allopora nobilis* or other arborescent organisms such as gorgonians. They are usually found on vertical walls in areas of strong current, but do not appear to be orienting into the current' (17 February 1981).

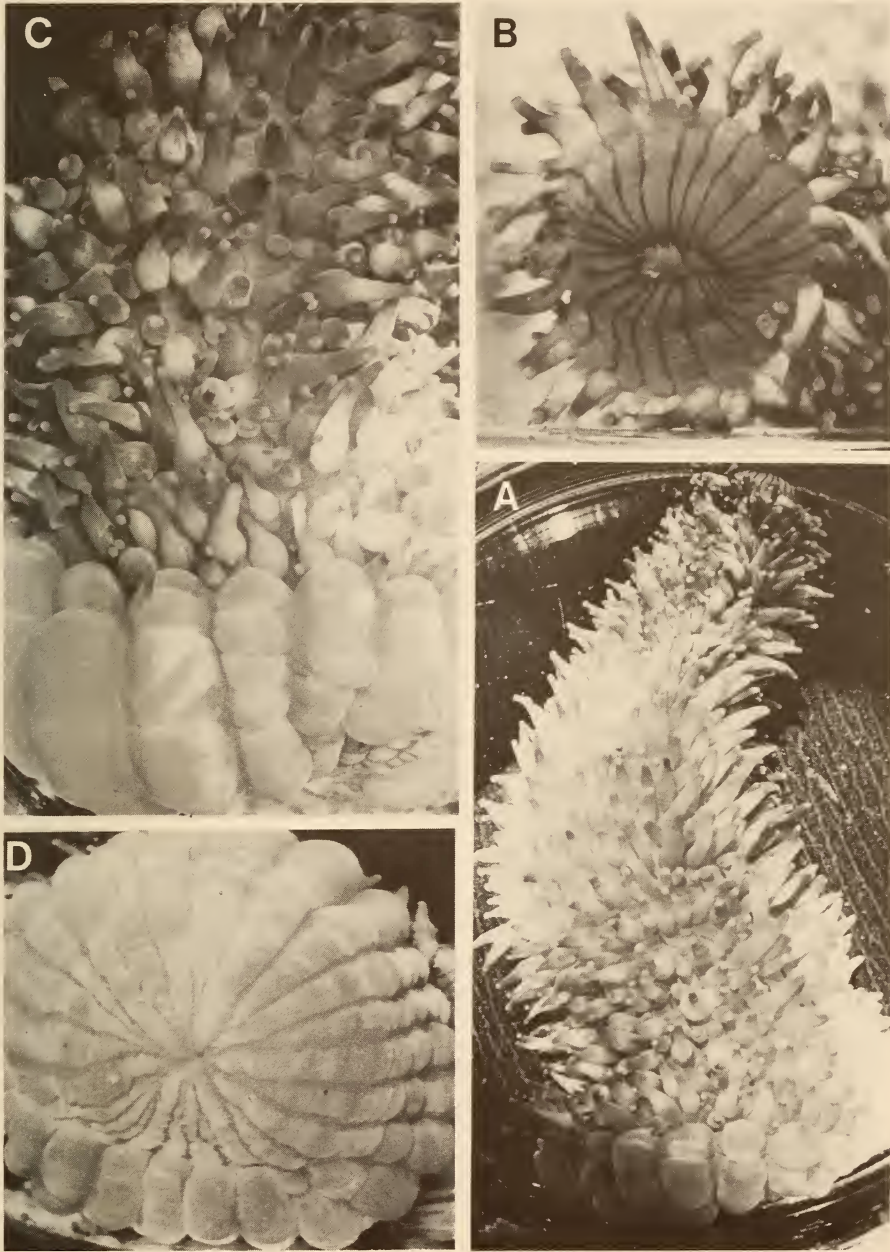


Fig. 3. Specimen from Oudekraal (SAM-H2822, photos C. L. Griffiths). A. Approx. $\times 0,66$. B. $\times 2$. C. Approx. $\times 1,25$. D. $\times 1$.

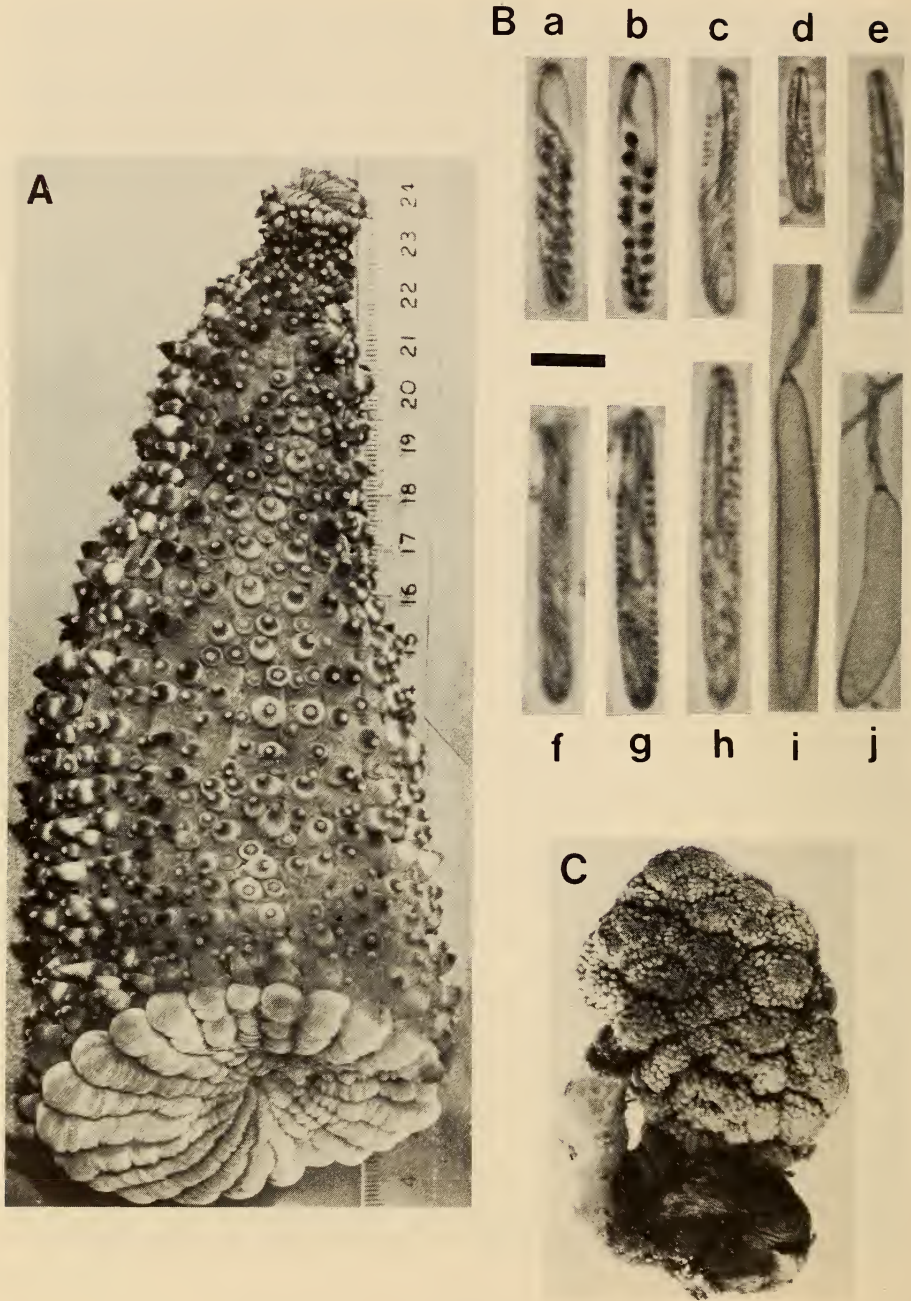


Fig. 4. A. Specimen from Oudekraal (SAM-H2822, photo E. A. Robson). Vesicles have shortened, revealing their irregular size and arrangement in relation to mesentery insertions. Note flatter basal disc, and peristaltic wave starting below the oral disc. Scale in cm. B. Cnidae from tentaculate vesicles (specimens SAM-H3030): a, b—spirocyst at two levels of focus; c, d, e—three basitrichs; f, g—an atrich at two levels of focus; h—atrach; i—discharged atrich; j—discharged basitrich. Bar is 5 μ . C. Preserved specimen of *Capnella thyrsoidea* from Hottentot's Huisie, Oudekraal (SAM-H3169), $\times 1$.

'On a recent dive I observed that one specimen had completely engulfed all but the basal stalk of an alcyonacean, *Capnella [thyrsoidea]*. The colony, which was almost the size of the anemone, completely filled the gastrovascular cavity. On a subsequent dive I observed three more anemones feeding on *Capnella*. One specimen had half-digested a *Capnella* colony. An additional six specimens were observed on that dive and all of them were within 10 cm of the remains of a basal disc of a *Capnella* colony. From these observations I am entirely convinced that [the] anemone is a species-specific predator on this alcyonacean. I think that the presence of the anemones on vertical walls is not through accidental drifting but through active association with their prey, which are most abundant on vertical surfaces. Incidentally, I have never observed any drifting individuals. The animals that I have seen have all been in 10–20 m of water. As *Capnella* occurs down to about 150 [metres] I suspect that the anemones occur much deeper, as well. . . . the strength of attachment I would equate . . . with that of a weakly attached sea cucumber. I have never seen them use the pedal disc in their attachment. I have only observed isolated individuals, never groups. I have seen them within a foot of each other, however. . . . I have not observed any small individuals' (14 April 1981).

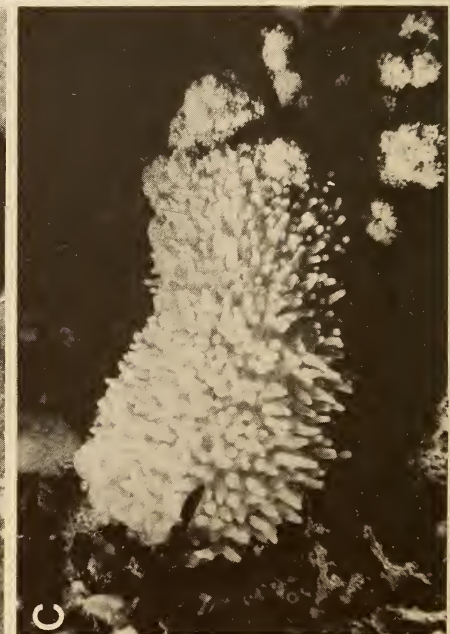
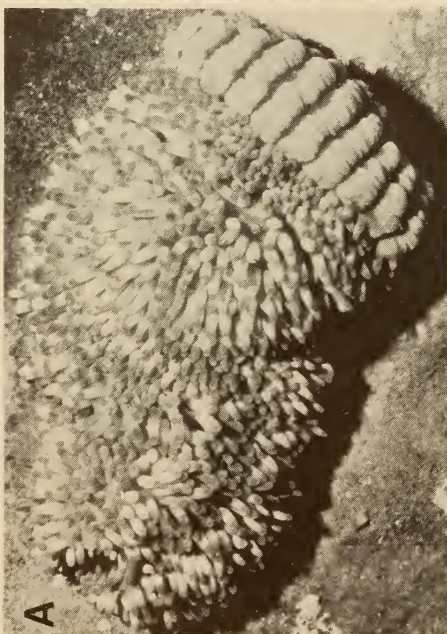
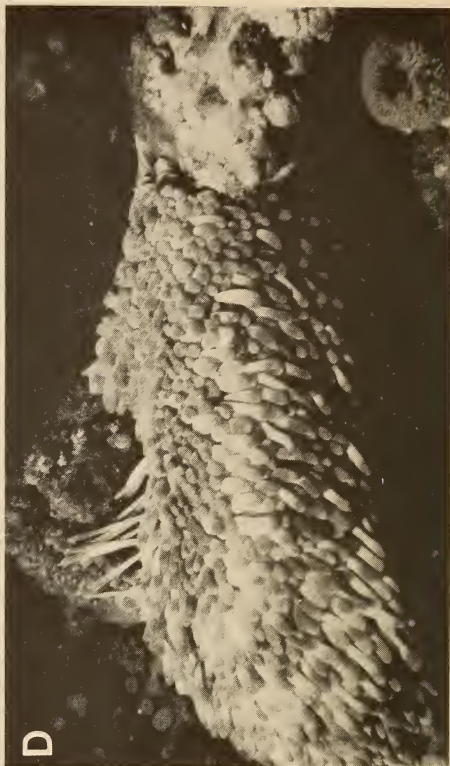
'The only thing I have seen the anemones "do" is eat or hang suspended by their lateral tentacles. I am not sure how long feeding takes but as the whole *Capnella* colony (except for the base) is digested including spicules, I would guess it is a prolonged process. The pedal disc can be used to adhere to the substrate but is always used in conjunction with the lateral tentacles. I have never observed them adhering to the substrate solely by means of the pedal disc in "typical" anemone fashion' (8 June 1982).

Most specimens seen by Gosliner were 10–20 cm in length. He estimates that an expanded colony of *Capnella thyrsoidea* can reach 15 cm in height and perhaps 10 cm in diameter.

Photographs of specimens from Hottentot's Huisie are shown in Figure 5A–D. The site is adjacent to Oudekraal and differs from it mainly in that there is little kelp in the immediate vicinity owing to the steep topography and vertical surfaces. The anemones seen here were all of similar colours. The specimen in Figure 5A has the column and pedal disc pale scarlet, the vesicles iridescent white with orange-red tips, and mesenterial insertions are marked as red lines. In underwater photographs shown in Figure 5B–D, three anemones look brownish pink, one paler than the others, the vesicles with tips of a darker colour, behind which is often a white band. In one case (Fig. 5D) the tips of about ten vesicles, greatly extended, are adhering to (probably) a *Capnella* colony to one side of the anemone. This anemone is already attacking a colony situated in front of the oral disc; exactly how it does this is not yet known.

Note on *Capnella thyrsoidea* (Alcyonacea, family Nephtheidae)

Capnella thyrsoidea (Verrill, 1865) is synonymous with *C. gilchristi* Thomson, 1910 = *C. rugosa* Kükenthal, 1902 (Utinomi 1960; J. Verseveldt, pers.



comm.). It appears to have a fairly wide distribution round the South African coast at depths of 11–155 m, extending from the Atlantic coast of the Cape Peninsula and False Bay to northern Natal (see Day *et al.* 1970; and the reference collection of specimens in the Zoology Department, University of Cape Town, identified by A. Tixier-Durivault). Kükenthal (1906) described *C. rugosa* from a specimen obtained south of Mossel Bay at 155 m, and another was reported by Thomson (1910) near East London at about 40 m. The usual substrate is probably rock.

A specimen from Oudekraal collected and preserved by T. M. Gosliner is shown in Figure 4C (SAM-H3169).

TAXONOMIC DESCRIPTION

(By K. W. England)

The discovery of the species of anemone described below necessitates redefinition of the order Ptychodactiaria to which it belongs, and the creation of a new family, the Preactiidae, to separate it from the other members of the order, *Ptychodactis patula* Appellöf (1893: 3–20) and *Dactylanthus (Cystiactis) antarctica* (Clubb 1908: 5–6). These two species are contained in the family Ptychodactiidae.

Order PTYCHODACTIARIA Carlgren, 1949 (redefined)

Diagnosis

Anthozoa (Dodecacorallia) with a definite base, with or without basilar muscles; parietobasilar muscles present or absent. Filaments with or without ciliated tracts. Gonads not enclosed in the mesogloea. Cnidome: spirocysts, atrichs, heterotrichs and basitrichs.

Family Preactiidae fam. nov.

Diagnosis

Ptychodactiaria with column covered with tentaculate vesicles which may or may not continue on to the periphery of the oral disc. Actinopharynx well developed. Two siphonoglyphs supported by directive mesenteries. Twelve pairs of mesenteries, mostly perfect, regularly arranged. All or almost all mesenteries fertile. Filaments with ciliated tracts. Basilar muscles present.

Fig. 5 (*facing page*). Specimens of *Preactis millardae* sp. nov. from Hottentot's Huisie, Oudekraal, photographed by T. M. Gosliner. Anemones seen there are 10 to 20 cm long. A. Living specimen photographed in the laboratory. B–D. Underwater photographs of three individuals in natural surroundings. B. Specimen attached to rock surface, stationary; oral disc to the right. C. An expanded colony of *Capnella thyrsoidea* (lower right) being attacked. D. A third individual feeding on *C. thyrsoidea* (to the right). Note that a few extended vesicles are attached by their tips to another *Capnella* colony (upper left).

Preactis gen. nov.*Etymology*

As this genus has the characteristics of an actinarian on the one hand but shows the characters of the Ptychodactaria on the other, the name *Preactis* was coined: *pre* from Latin *prae* = before or in advance, and *actis* from *Actinia* = sea anemone, modern Latin from Greek ακτις.

Diagnosis

Preactiidae without ectodermal longitudinal muscles on the column, except where they continue for a short distance from the vesicles. Sphincter absent. Actinopharynx with pocket-like prolongations and deep folds between the siphonoglyphs. Siphonoglyphs well developed and considerably prolonged beyond the length of the actinopharynx. The same number of mesenteries distally and proximally. Mesenteries fused together axially for approximately one-third the length of the column, from the base upwards. Cnidome: spirocysts, atrichs and basitrichs.

Type species

Preactis millardae sp. nov.

Preactis millardae sp. nov.

Figs 2-4B, 5-10A

Material

The following description is based on seven preserved specimens from three localities. All were dissected and histological preparations were made as required.

Holotype

SAM-H1677 in the South African Museum, Cape Town. Adult specimen from rock pool at Onrus, near Hermanus, collected by M. R. Polchet, 4 February 1973.

Paratypes

SAM-H2822 in the South African Museum, Cape Town, and BMNH 1983.4.27.1 in the British Museum (Natural History). Two large adult specimens from Oudekraal, Cape Peninsula, depth 10-15 m, collected together by C. L. Griffiths, 7 October 1976. CASIBP 034038 in California Academy of Sciences, San Francisco. Specimen from Oudekraal, Cape Peninsula, depth 20 m, collected by T. M. Gosliner, January 1981.

Additional material

SAM-H3030 in the South African Museum, Cape Town. Four small specimens (three of these were examined here) from Maclear's Beach, Cape Point Nature Reserve, collected by S. X. Kannemeyer, 4 August 1980.

Sections of SAM-H1677, SAM-H2822, and BMNH 1983.4.27.1, by K. W. England, in the British Museum (Natural History). Sections of CASIBP 034038, by D. F. Dunn, in the California Academy of Sciences, San Francisco.

Etymology

The species is named after Dr N. A. H. Millard, South African Museum, Cape Town.

Description

Column conical, the base wider than the disc. The column completely covered with tentaculate vesicles, arranged irregularly, though in places a vertical or horizontal alignment may occur (see Fig. 2A-B). Near the margin the vesicles occur singly or in pairs over both exo- and endocoels, but further down the column the number in each exo- and endocoel may increase to three or four, arranged in horizontal rows. The rows on the exocoels may or may not line up with those on the adjacent endocoels, and vice versa (Fig. 4A). The vesicles are conical with hemispherical tips, occasionally with a bifurcated tip. The uppermost vesicles are positioned on or near the periphery of the oral disc and may encroach on to the disc (Figs 2C, 3B). An occasional vesicle may occur on the base.

The disc is small and flat with a single central mouth.

The base is circular in outline, the diameter exceeding four times that of the disc and capable of a much greater expansion. The mesenterial insertions can easily be seen through the base tissue. The limbus is distinct.

Anatomy

The musculature of the column is weak and consists only of endodermal circular muscle, which is only one fibre high (fibres less than 1 micron thick), and the mesogloal surface forms only simple folds (Fig. 8C). Sphincter absent. Ectodermal longitudinal muscle fibres were not seen on the column, and if present they would be less than 0.5 microns in diameter.

The tentaculate vesicles have both circular endodermal muscle and longitudinal ectodermal muscle which continues for only a short distance on to the column.

Two distinct siphonoglyphs are present, supported by directive mesenteries, and are prolonged aborally by as much again as the length of the actinopharynx. Below the mouth the middle portion of the actinopharynx is greatly expanded and in contraction it is thus thrown into several deep folds and pocket-like protuberances in the area between the siphonoglyphs (Fig. 6). This arrangement increases the potential diameter of the actinopharynx for feeding purposes.

The mesenteries are hexamerously arranged in two cycles, $6 + 6 = 12$ pairs. In fully developed individuals all the mesenteries are perfect and fertile and bear well-developed ciliated tracts in the uppermost region of the filaments. In younger specimens some mesenteries of the second cycle may not be completely developed. The lower parts of the perfect mesenteries are fused together axially, the zone of fusion extending from the base upward for approximately one-third

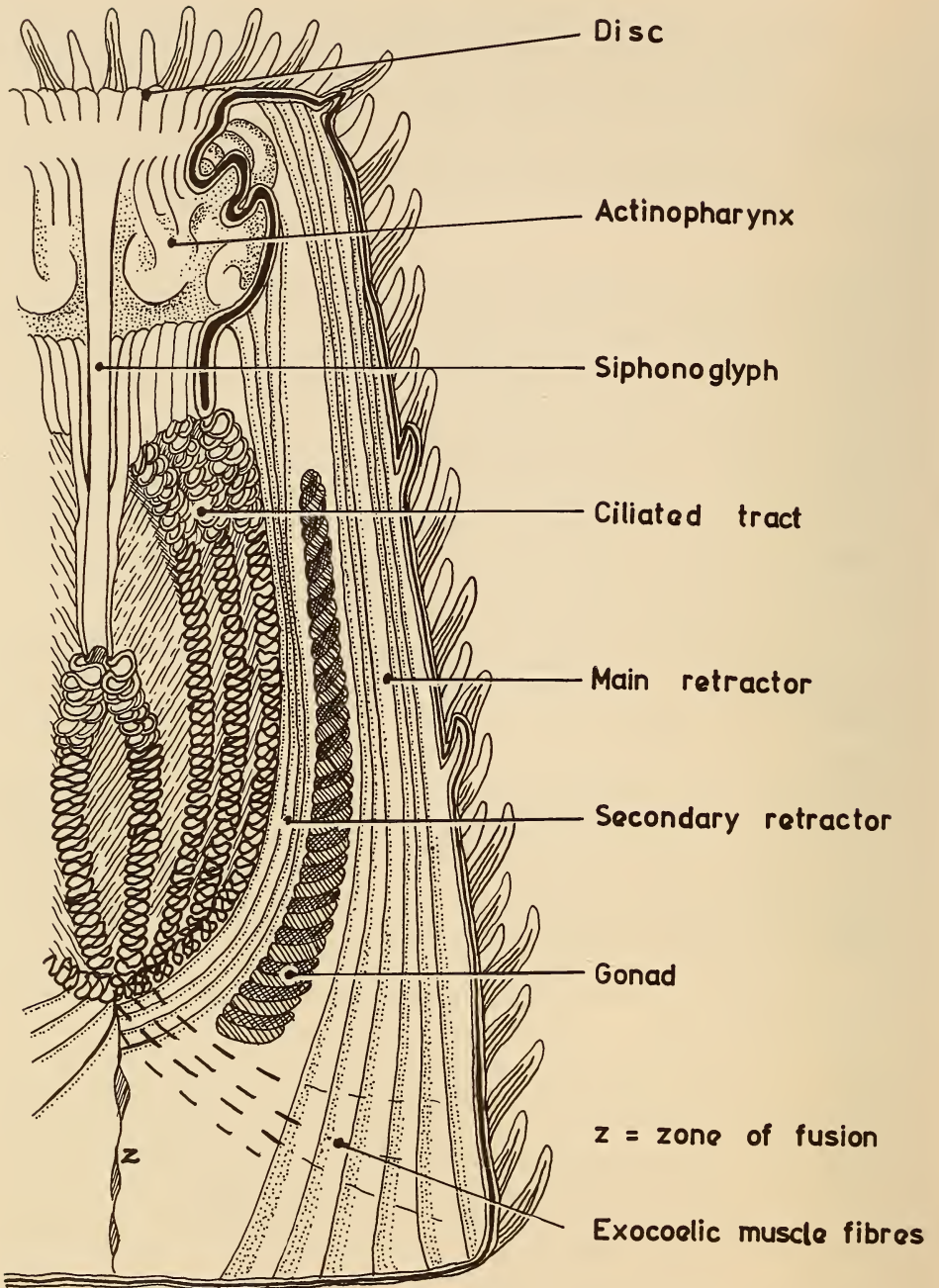


Fig. 6. *Preactis millardae* sp. nov. sectioned longitudinally with endocoelic view of one mesentery (not to scale).

the length of the enteron. The fusion is not complete and openings along the line of fusion remain, connecting the endo- and exocoels (Fig. 6).

The mesenteries possess large oral stomata, but marginal stomata are lacking.

The musculature of the mesentery is weak and unusual (Fig. 7). There are two distinct retractor muscles. The main retractor extends from the base to the discal region, some of the processes terminating under the disc but outer ones ending on the column just below the disc. A secondary or pharyngeal retractor is located behind the filaments, arising from the upper part of the fused portion of the mesenteries and terminating in the region of the expanded middle portion of the actinopharynx (Fig. 6). The reverse side of the mesentery lacks a parietobasilar muscle and, instead, weak muscle bands arise at the top of the fused portion of the mesenteries and fan out towards the column near the limbus, but they become very diffuse and cannot be traced to the column wall (Fig. 6). Very weak basilar muscles are present (Fig. 8A–B).

The gonads occur in a layer on either side of the mesogloea of the mesentery, and they are not embedded in the mesogloea (Fig. 8D). They arise behind the filaments, between the two retractors, and extend from below the actinopharynx down to the region of the fused part of the mesenteries (Fig. 6).

Mesenteries

Inspection shows that mesenteries arise in the normal actinian sequence, and this is reflected in the extent to which they are fused centrally. The first four mesenteries formed—the first two couples—have the longest zones of fusion. Shorter zones of fusion are found in turn in the two pairs of directive mesenteries and in the last two couples, and the shortest are found in mesenteries of the second cycle.

Mesenteries were fully formed in all the specimens examined except in three instances, which seem to be second-cycle mesenteries in the course of development. Their appearance suggests the following sequence of development, although whether these examples are normal or exceptional cannot yet be determined. A pair of mesenteries arises initially at the centre of the column as an inverted pocket on the body wall, closed at the top and open at the bottom (see Fig. 9, which corresponds to a dorsolateral exocoel in specimen BMNH 1983.4.27.1). The pocket grows upward and so moves towards the crown, while splitting progressively along its midline so that two mesenteries are formed. These also grow down the column towards the pedal disc, and filaments form on the free edges below the pocket. Ciliated tracts develop in the appropriate region. It is suggested that the two mesenteries become completely separated when the pocket reaches the top of the column, after which they connect individually with the oral disc and later the pharynx, and proximally with the pedal disc and with the central region of mesenteric fusion.

In one specimen (from SAM–H3030) a pocket giving rise to a pair of second-cycle mesenteries in a lateral exocoel, the mesenteries showing filaments with ciliated tracts and also retractor muscles, was almost fully enclosed in

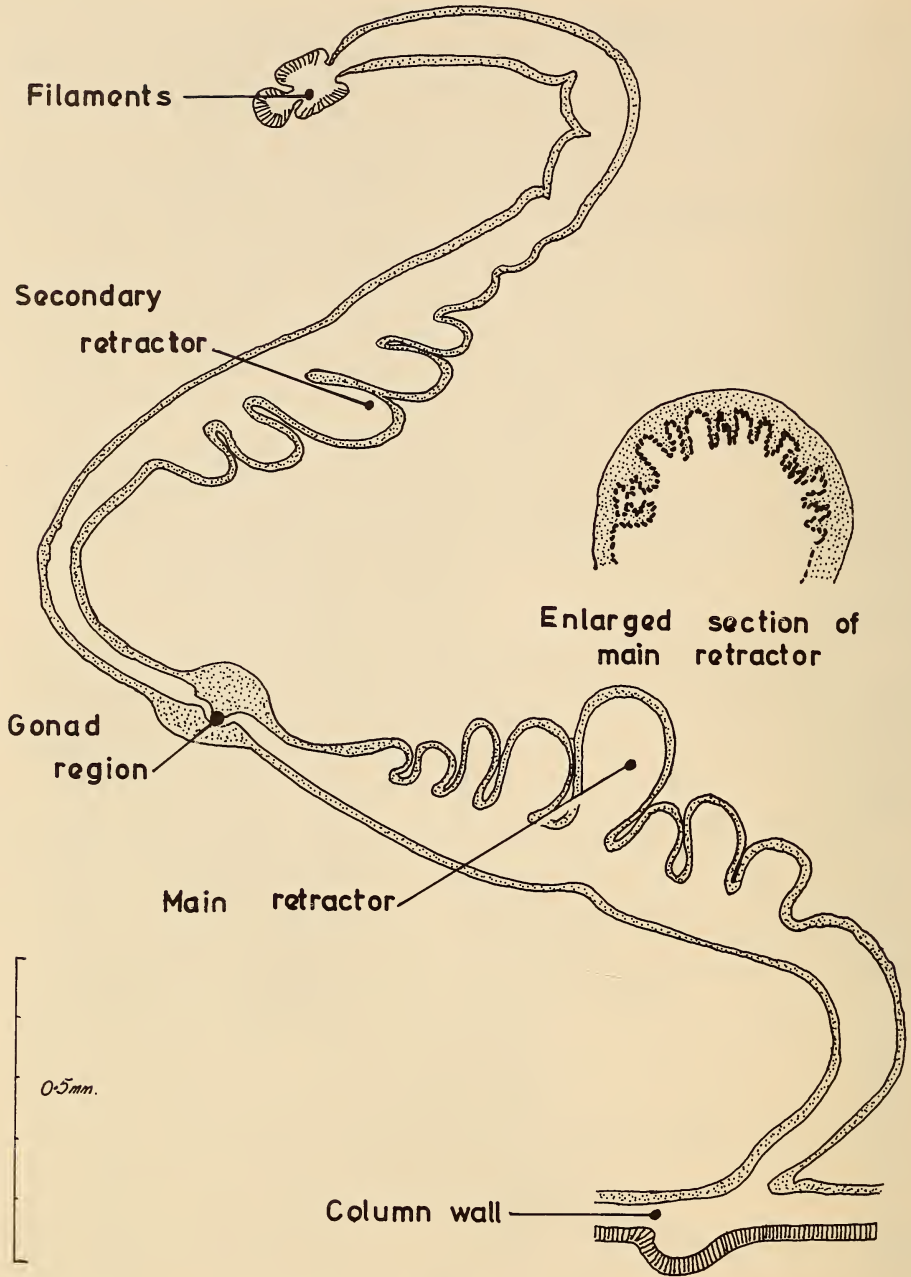


Fig. 7. *Preactis millardae* sp. nov. Transverse section of mesentery illustrating the position and shape of the main and secondary retractors and the position of the gonad.

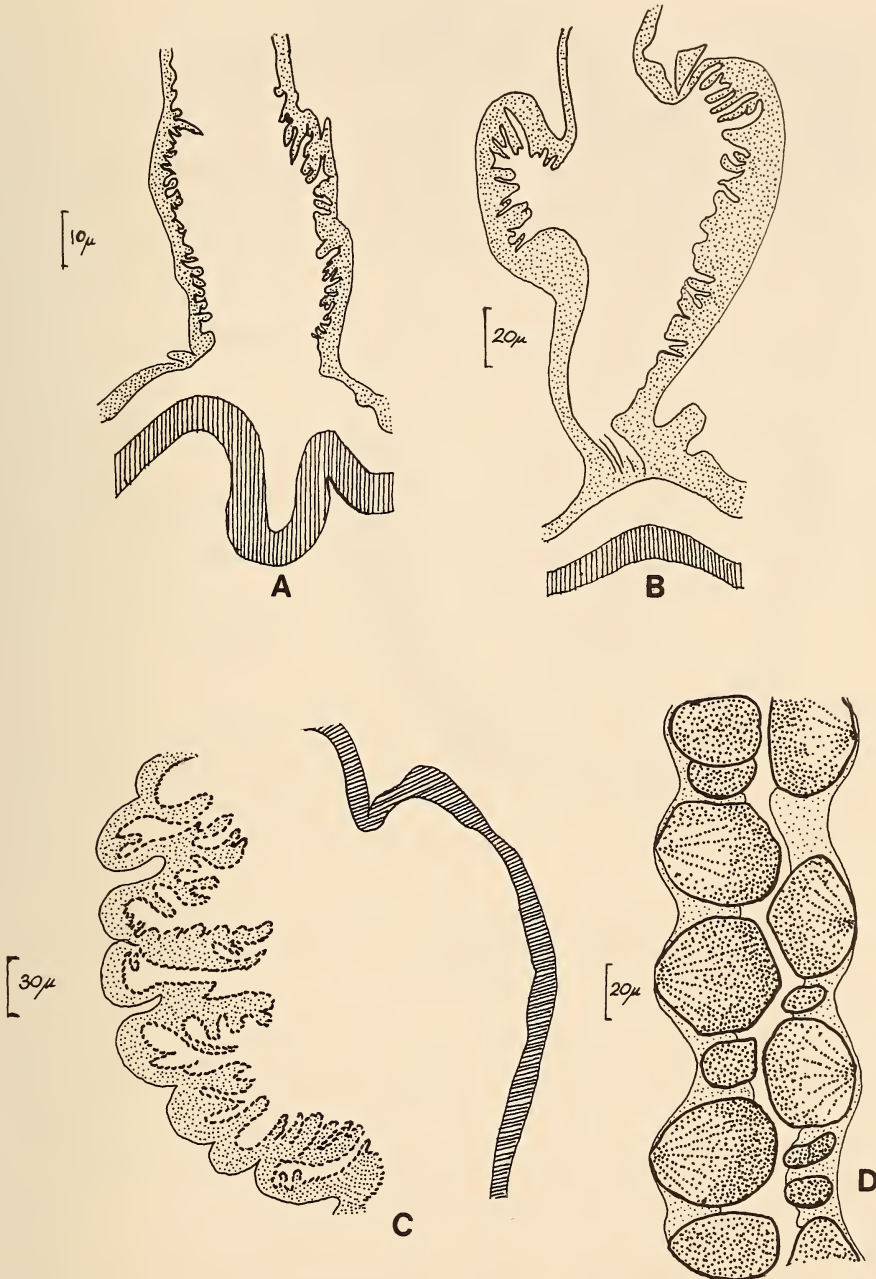


Fig. 8. *Preactis millardae* sp. nov. A. Basilar muscle in a vertical section of the pedal disc (SAM-H1677). B. Basilar muscle in a similar section (SAM-H2822). C. Circular muscle of column in a vertical section below the margin (SAM-H1677). D. Section through the gonad, male (SAM-2822). Endoderm stippled, mesogloea white, ectoderm hatched.

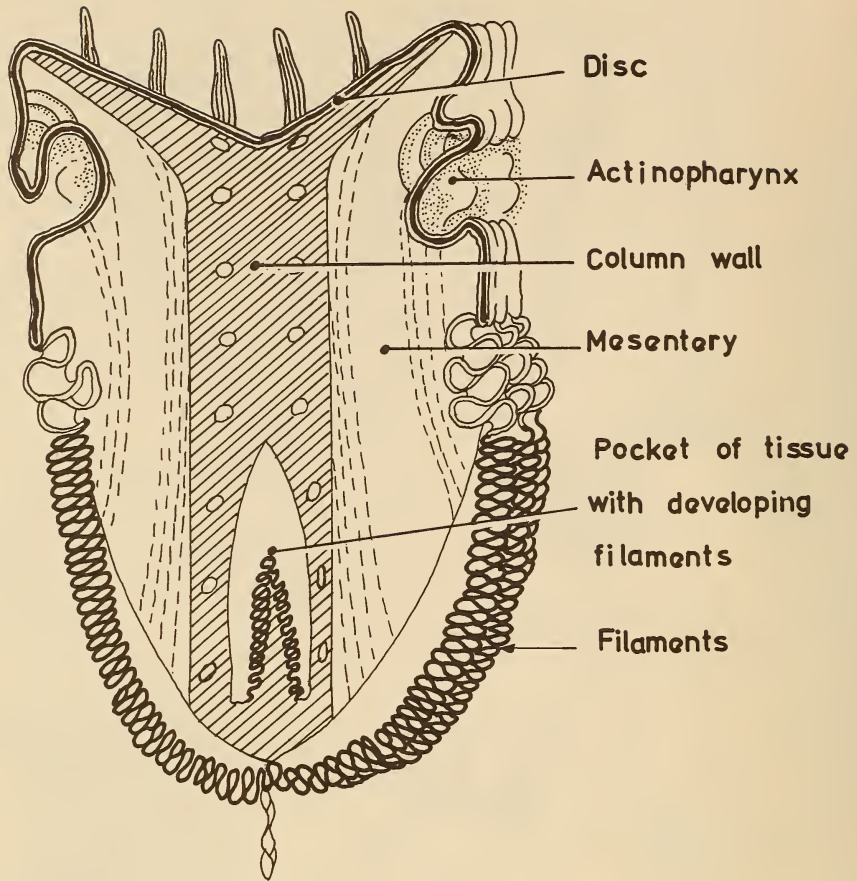


Fig. 9. *Preactis millardae* sp. nov. Diagram of part of a specimen with pharynx and disc cut open radially, showing the position of a pair of developing second-cycle mesenteries: see text.

another pocket. The outer pocket, very large, extended from below the oral disc downward to further even than mid-column. It consisted of two first-cycle mesenteries still joined for two-thirds of their length, the pocket having failed to split along its midline. There were thus no filaments although retractor muscles and gonads were present. These first-cycle mesenteries were also anomalous in being from adjacent pairs (the ventro- and dorsolaterals).

Cnidome

The size ranges and types of cnidae observed are given in Table 1, and the types illustrated in Figures 4B and 10A. Of particular interest is the spirocyst in which the helical folds of the undischarged thread can be seen with the light microscope (Fig. 4B, a-b).

TABLE 1

Cnidae of *Preactis millardae* gen. et sp. nov. (measurements in microns).

Location/Type	SAM-H1677	SAM-H2822	BMNH 1983.4.27.1
<i>Tentacles</i>			
Spirocysts	13,8-16,3 × 2,5	14,6-17,9 × 2,0	14,6-20,0 × 2,6-3,3
Basitrichs	12,5-16,3 × 2,5-3,0	15,2-21,2 (23,8) × 2,0-3,3	13,3-17,9 × 2,0-2,6
Atrichs	20,0-26,3 × 2,5	20,5-27,8 × 2,6-4,0	17,9-31,2 × 2,6-4,0
<i>Disc</i>			
Basitrichs	13,3-15,2 × 2,0-2,6	—	13,3-17,2 × 2,0-2,6
<i>Pharynx</i>			
Atrichs	20,0-22,5 × 2,5-3,0	17,2-23,2 × 2,0-3,3	15,2-25,2 × 2,0-3,3
Basitrichs	—	16,6 × 2,0 (1 only)	15,9-17,9 × 2,6 (3 only)
<i>Filaments</i>			
Atrichs	16,3-22,5 × 2,5	17,9-24,5 (27,8) × 2,0-3,3	18,5-23,8 (26,5) × 2,0-2,6
Basitrichs	—	13,3-15,9 × 2,0 (few)	11,3-13,3 × 2,0-2,6

The size ranges were established by measuring the smallest and largest of each type found, from at least three separate squash preparations taken from different sites of each area examined, i.e., the tentacles, disc, actinopharynx, and filaments. Examination was carried out using normal light microscopy (bright field and phase contrast).

Identification

From the foregoing description it is evident that this species resembles in many respects *Dactylanthus antarcticus* Carlgren, 1911 (Dunn 1983). The possibility of *Dactylanthus* being a young or less well-developed form of the present species was considered, and so the specimen of *D. antarcticus* described and identified by Stephenson (1918) from the Terra Nova Expedition was examined (BMNH 1918.5.12.4).

Although histological sections were not made, a few new details can be added to the descriptions given by Clubb (1908) and Carlgren (1911). *Dactylanthus* has a double retractor muscle similar to that of the new species, the second or pharyngeal retractor being in the same position. The gonads similarly occur between the two retractors but they are lower down the column than in the new species, although not completely below the filaments as stated and illustrated by Carlgren (1911, pl. 1 (fig. 3)). The specimen shows no evidence of parietobasilar muscles.

The nematocysts of *Dactylanthus antarcticus* were examined and good agreement with the size ranges given by Carlgren (1940) was achieved. Dunn (1983) redescribed *D. antarcticus* and her measurements for the nematocysts are slightly larger than here but of the same order of magnitude. In addition, heterotrichs were found and a few nematocysts were seen that resembled holotrichs. It is thought that the latter were probably developing atrichs, but further work is required to substantiate this possibility. The types and size ranges of cnidae found were as follows:

Vesicles of column:	Spirocysts	16,3–21,3 × approx. 2,0 μ
	Atrichs	18,8–31,7 × 3,0–4,0 μ
	Heterotrachs	7,5–15,6 × approx. 2,0 μ
Actinopharynx:	Atrichs	11,3–23,2 × 2,0–3,3 μ
Filaments:	Atrichs	11,3–18,8 × 2,0–2,5 μ

These are illustrated in Figure 10B. The differences between the nematocysts of *Dactylanthus* and of the new species can be seen by comparing the cnidae of Figure 10A–B. Although the types of nematocysts are the same in both, the spirocysts differ: in *Dactylanthus* they are more like those found in the Actiniaria in that the folds of the thread are not visible and the thread occupies more of the capsule.

From the study of cnidae it is clear that *Dactylanthus* is not a young form of the new species.

The taxonomic characters of the new species and those of *Dactylanthus* are given in Table 2, listed in the order in which they would be examined, together with those of *Ptychodactis patula* Appellöf, 1893. It can now be seen that the new species differs from both the others in three features that are of major taxonomic importance, i.e.

- (i) ectodermal longitudinal muscle of the column is absent,
- (ii) ciliated tracts are present on all filaments,
- (iii) basilar muscles are present.

TABLE 2

Comparison of the major characters of *Ptychodactis*, *Dactylanthus*, and *Preactis* gen. nov.

	<i>Ptychodactis</i>	<i>Dactylanthus</i>	<i>Preactis</i> gen. nov.
1.	Column smooth.	Column with single vertical rows of tentaculate vesicles over each endo- and exocoel.	Column with multiple irregular rows of tentaculate vesicles over each endo- and exocoel.
2.	Tentacles present on oral disc.	No tentacles on oral disc but peripheral tentaculate vesicles.	No tentacles on oral disc but peripheral tentaculate vesicles.
3.	Ectodermal longitudinal muscle present on column.	Ectodermal longitudinal muscle present on column.	No ectodermal longitudinal muscle on column.
4.	No sphincter.	Weak sphincter present.	No sphincter.
5.	Up to four cycles of mesenteries present.	Six pairs of mesenteries perfect.	Twelve pairs of mesenteries perfect.
6.	Mesenteries not fused together near the base.	Mesenteries fused together axially near the base.	Mesenteries fused together axially near the base.
7.	No ciliated tracts.	No ciliated tracts, but filaments of second cycle terminate in bilobed funnel.	Ciliated tracts present, bilobed funnels absent.
8.	Gonads not enclosed in the mesogloea.	Gonads not enclosed in the mesogloea.	Gonads not enclosed in the mesogloea.
9.	Basilar muscles absent.	Basilar muscles absent.	Basilar muscles present.
10.	Parietobasilar muscles present.	Parietobasilar muscles absent (p.323).	Parietobasilar muscles absent.

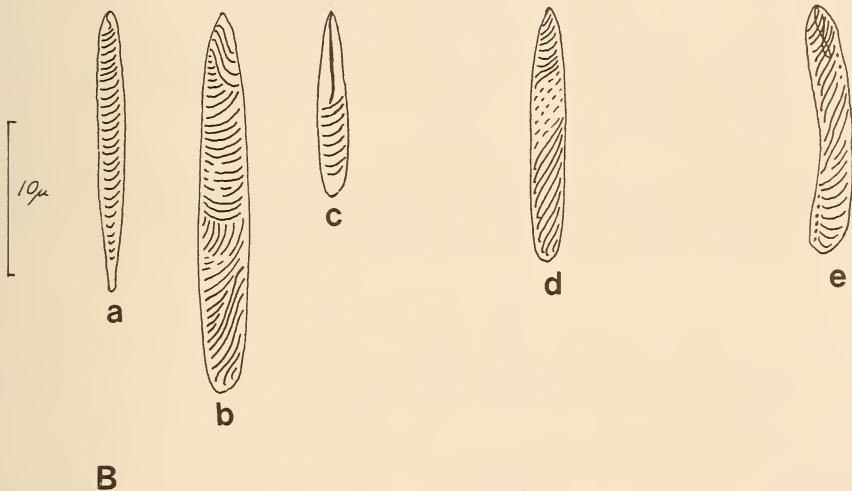
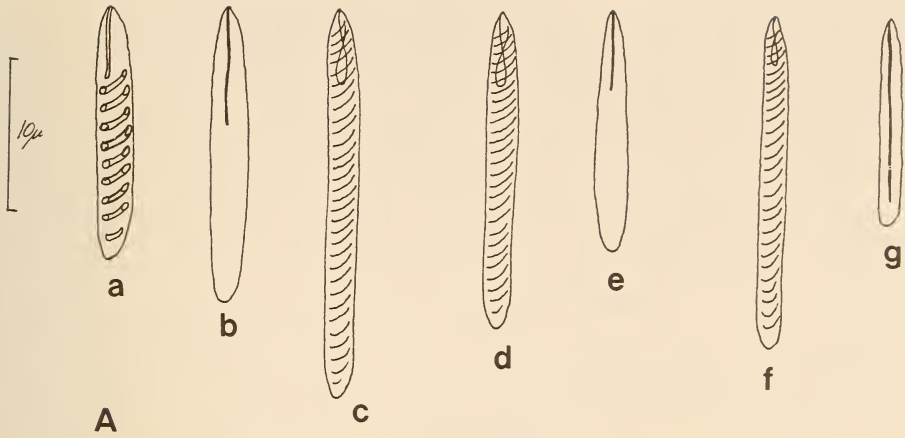


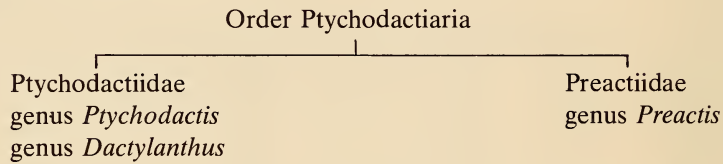
Fig. 10. A. *Preactis millardae* sp. nov. Cnidae (see Table 1). Vesicles: a—spirocyst, b—basitrich, c—atrich. Pharynx: d—atrich, e—basitrich. Filaments: f—atrich, g—basitrich. B. *Dactylanthus antarcticus* (BMNH 1918.5.12.4). Cnidae. Vesicles: a—spirocyst, b—atrich, c—heterotrich. Pharynx: d—atrich. Filaments: e—atrich.

These features prevent the new species from being referred either to *Dactylanthus* or to *Ptychodactis*. Furthermore, they would even rule out the inclusion of this species in the Ptychodactiaria as defined by Carlgren (1949) and would suggest that it belongs to the Actiniaria. However, as the gonads are not enclosed in the mesogloea of the mesenteries, the Actiniaria are precluded.

The combination of these few but significant features with gonads not contained in the mesogloea suggests a species that in some respects may be intermediate between the Ptychodactiaria and the Actiniaria, and the name *Preactis* gen. nov. is proposed to reflect this.

It is also proposed to redefine the order Ptychodactiaria to accommodate the new genus (p. 315). The primary character of the Ptychodactiaria becomes the presence of gonads not enclosed in the mesogloea, and other characters in Carlgren's (1949) diagnosis are modified, i.e. ciliated tracts present or absent, and basilar muscles present or absent.

If Carlgren's taxonomic criteria are applied it is not possible to include *Preactis* in the family Ptychodactiidae. Carlgren (1942) considered the presence or absence of basilar muscles an important character of fairly high classificatory value, and he did not place species with and without them in one family. The presence or absence of ciliated tracts on the filaments is of similar significance. In order to accommodate *Preactis*, which possesses basilar muscles and ciliated tracts (whereas *Dactylanthus* and *Ptychodactis* do not), a new family in the Ptychodactiaria is proposed. The diagnosis of this family, the Preactiidae fam. nov., is given on p. 315.



It is clear that further research is needed to resolve the taxonomic anomalies offered by the Ptychodactiidae, for it will be appreciated that *Dactylanthus* and *Preactis* are much more alike than *Dactylanthus* and *Ptychodactis*.

COMMENTS

The affinities of the Ptychodactiaria and their geographical distribution deserve further thought.

The higher taxa of Anthozoa as Carlgren saw them in 1949 are these:

ANTHOZOA

Subclass Zoantharia

- Orders Ptychodactiaria
- Corallimorpharia
- Actiniaria
- Madreporaria
- Zoantharia
- Antipatharia
- Ceriantharia

Subclass Alcyonaria

In 1944 he expressed his views on 'the lines of development of the Anthozoa' as a diagram (see, however, the more recent views of Schmidt & Zissler 1979). Carlgren's graphic presentation is conveyed in Figure 11. He considered the Ptychodactiaria as 'a primitive group which has separated early from the Actiniaria and gone their own way' (Carlgren 1942).

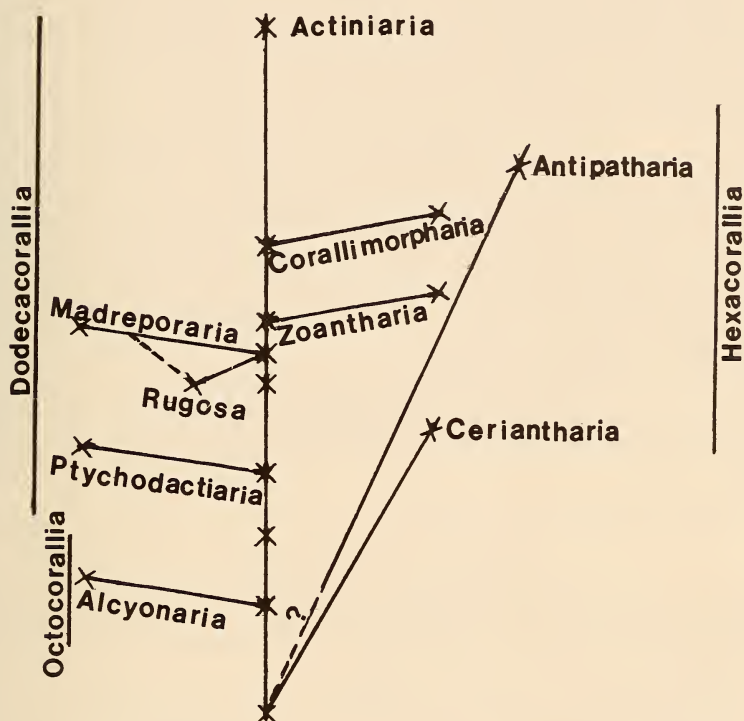


Fig. 11. Diagram after Carlgren (1944), depicting his view of lines of development in the Anthozoa.

Whether the Ptychodactiaria are primitive or, as judged earlier by Stephenson (1921), 'a collection of curiosities which have developed along a little line of their own', new observations are now needed on *Ptychodactis patula*, if possible on living material. It has an arctic-boreal distribution (Carlgren 1949) and Appellöf's (1893) specimens were found on gorgonians. Details of its biology are quite unknown, however, and the same is true of *Dactylanthus*. The functions of special anatomical features are difficult to infer from preserved specimens and the muscular and ciliary systems, for example, need re-examination.

The features of *Dactylanthus* that separate it from *Ptychodactis* and relate it to *Preactis* may be considered to include its Antarctic distribution. The distribution of *D. antarcticus* is summarized by Dunn (1983) as south of the 64th parallel,

on both sides of Drake Passage between 56° and 65°W, and in the Ross Sea and north of it (162°W to 170°E). A circumpolar distribution of this kind would have followed the isolation of the Antarctic continent (i.e. post-Eocene: Frakes 1979). It is possible to speculate that if *Preactis* were derived from the same ancestral Antarctic stock as *Dactylanthus* the formerly narrower polar seas might have allowed ancestral pelagic larval stages to be carried northward by currents towards southern Africa and elsewhere. Although the life history of Ptychodactiaria is still unknown, *Dactylanthus*, *Preactis* and *Ptychodactis* all have numerous and small oocytes and the existence of pelagic larvae seems probable.

In view of the distribution of *Preactis millardae* (Fig. 1) it is worth mentioning that Carlgren (1938) thought two species of littoral sea anemones from the Atlantic coast of the Cape Peninsula to be 'certainly of subantarctic origin'. *Phellia aucklandica*, collected from Oudekraal at low water by T. A. Stephenson, he found identical to specimens from the Auckland Islands, the Inaccessible Archipelago and Gough Island. *Helianthella annularis*, from Oudekraal and Kommetjie, is an intertidal species with a brood pouch first described by Carlgren (1938). He considered it to show a close resemblance to *H. kerguelensis* found at Kerguelen and Macquarie Island.

The discovery of *Preactis millardae* raises very interesting questions on the taxonomy, zoogeographical history and phylogeny of the Ptychodactiaria and it is hoped that a greater awareness of these animals may lead to further work on their biology.

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Several colleagues have contributed materially to this paper: without Professor J. H. Day, Dr T. M. Gosliner, Dr C. L. Griffiths and Dr N. A. H. Millard there would be few recorded observations and fewer, if any, specimens. It is a pleasure to thank them for their generous help. Dr R. J. Griffiths, M. R. Polchet and Mr S. X. Kannemeyer are thanked for collecting some of the specimens. A visit by E. A. Robson to the Zoology Department, University of Cape Town, in 1976, for which thanks are due to Professor A. C. Brown, made it possible subsequently to collate existing records and to include them here. Dr D. F. Dunn is thanked for valuable comments and for sending us her review of *Dactylanthus* before publication. Dr J. Verveveldt of the Rijksmuseum van Natuurlijke Historie, Leiden, kindly identified the specimen of *Capnella thyrsoidea* shown in Figure 4C.

NOTE IN PRESS

The authors have seen photographs taken by S. Gerber of a probable further specimen of this anemone. The specimen was observed near Gordon's Bay, nearly due east from Simonstown at the opposite side of False Bay (April 1984, 25 m depth, 5.7 km offshore). We wish to thank Mr S. Gerber from Stellenbosch and Miss E. Louw of the South African Museum for providing this information.

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